

Exercise: a nurse-run asthma school

Read the attached paper, Evaluation of a nurse-run asthma school (*International Journal of Nursing Studies* 1999; **36**: 145-151)

Evaluation of a nurse-run asthma school

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Abstract

Important aims of the study were to investigate whether an educational program (the 'Asthma School') directed by a nurse led to improved knowledge of the disease, to improved self-medication and self-management and to improved self-rated functional status. A total of 32 patients (6 males, 26 females, mean age 43 years) was included. The following methods were used to collect the data before and one year after the Asthma School was completed, two study-specific questionnaires for collecting demographic data and measuring different aspects of the patients' knowledge of the disease and its treatment, monthly diary cards, lung-function tests (FEV1) and the Sickness Impact Profile (SIP) questionnaire. The main results of the study were an improved knowledge of the disease and its treatment, better self-management, i.e. more frequent use of the peak expiratory flow meter (PEF-meter) and use of inhaled bronchodilators on an as-required basis, fewer patients on sick-leave and a better self-rated physical health status. However, in spite of these encouraging results, the lung function was found to be unaffected, no pronounced changes in the use of asthma drugs could be found and the patients' need for medical care remained the same.

1. Introduction

Asthma is a common and chronic inflammatory disease of the airways. Its prevalence has been reported to be on the increase in Sweden, as well as in many other countries. Studies indicate that asthma affects about 6-7% of the adult population in Sweden (Lundbäck et al., 1993). The disease is characterized by exacerbations of coughing, wheezing and difficult breathing that are usually reversible but can be severe and sometimes even fatal. Exacerbations can be looked upon as treatment failures, because they can be prevented if the treatment is comprehensive and ongoing. International Consensus guidelines on the good management of asthma now exist (International Consensus Report, 1992) but are of course of little value if the proposed treatment is not followed by the patient.

Although consensus still does not exist about the exact determinants of compliance (Blackwell, 1992), it has been stated that educational programs for patients with chronic diseases improve the compliance with medical regimens (Mazzuca, 1982). Studies have shown that such educational programs for asthmatics improve their knowledge of the disease (Hilton et al., 1986; Jenkinson et al., 1988. Ringsberg et al. 1990; Taggart et al., 1991) but that morbidity is not necessarily reduced (Partridge, 1992). Patient education is an important task for the nurse (Smith, 1987) and nurse led education programs are often used within the care of the asthma patients (Partridge, 1995).

A nurse-run Asthma School, has been carried out in the out-patient clinic at the Department of Respiratory and Allergic Diseases at Huddinge University Hospital since 1986. This program is offered to all patients with asthma referred to the clinic with the hope to improve their knowledge of the disease and its treatment and thereby improve their self-management. However, the possible

effects of the education have never been investigated, and this was why the current investigation was undertaken.

The aim of the present investigation was to study whether the education program led to:

- improved knowledge of the disease of asthma and its treatment
- fewer patients smoking
- more frequent use of the peak expiratory flow meter (PEF-meter)
- improved lung-function
- improved self-medication
- reduced need for medical care (i.e. fewer visits to the Emergency Room and admittance to hospital)
- fewer patients in need of sick-leave from work
- improved self-rated functional health-status

2. Materials and methods

2.1. Patients

The patients were recruited consecutively over one year among all patients ($n=60$) who agreed to participate in the Asthma School. Fifty-two of these patients (87%) initially agreed to participate in the study. However, 19 patients were excluded for the following reasons: they attended the Asthma School for less than three sessions ($n = 14$), they were admitted to Åre Hospital, a special asthma-care clinic ($n = 2$), they did not answer the questionnaires after completed education ($n = 2$) or they stopped using asthma drugs ($n = 1$). One patient died during the study period, owing to a malignancy. Finally, 32 patients (6 males, 26 females, mean age 43, range 18-67 years) remained for the evaluation. The duration of asthma ranged from 9 months to 54 (median 6) years. The characteristics of the patients included are shown in Table 1.

2.2. Methods

2.2. 1. The educational program

Groups of 6-8 asthmatics, mixed in gender, age, asthma duration and severity, attended lectures once per week over a period of six weeks (2 h per session). The Asthma School included education on the anatomy and physiology of the lungs, the pathophysiology and the pharmacological treatment of asthma, breathing technique, exercise and training suitable for asthmatics and the psychosocial aspects of asthma. All participants were also lent a PEF-meter and instructed how to use it. They were told to register their peak flow values twice daily. This was done in order to enable the patients to understand better the variability of the disease, to let them self-adjust their daily treatment with inhaled steroids and thereby showing them the benefits of using a PEF-meter every day.

Table 1
Description of the 32 asthmatics included in the study

	<i>n</i> (%)
Gender	
Male	6 (19)
Female	26 (81)
Marital status	
Single-living	15 (47)
Cohabiting	17 (53)
Occupation	
Working full or part time	23 (72)
Studying	3 (9)
Retired-age	1 (3)
Retired-ill health	4 (12)
Out of work	1 (3)
Housewives	0
Sick-leave > 6 months	0
Education	
Compulsory school	7 (22)
Upper secondary school	15 (47)
University	10 (31)
Asthma severity	
FEV1 \geq 80%, <i>n</i> (%)	24 (75)
FEV1<80%, <i>n</i> (%)	8 (25)
Smoking habits	
Non-smokers	14 (44)
Ex-smokers	12 (37)
Current smokers	6 (19)
Age	
Median (range) years	43 (18–67)

A specialist clinical nurse was in charge of the Asthma School and was therefore present during all lectures. Her role was to educate, train and support the patients. Several other health-care professionals took part in the education: a physician, a psychologist, a physiotherapist, a dietician and an occupational therapist. Furthermore, a representative of the patients' national organization gave information about their activities. The same health-care team gave the same lectures to all the patients included in the study.

2.2.2. Questionnaires

Two study-specific questionnaires were developed for this study. The questionnaires were tested for content validity in a pilot study prior to the main investigation. Some minor corrections were made. The items had the response format of yes or no or multiple choice questions.

The first questionnaire consisted of 24 items concerning demographic data, the use of asthma drugs and the PEF-meter, smoking habits, need for medical care and sick-leave.

The second questionnaire consisted of 26 items. It was designed to match the content of our local educational program at the clinic and it was therefore decided not to use a questionnaire developed elsewhere. Eight items concerned knowledge of the disease and included questions on physiology and pathophysiology. Another eight items concerned knowledge of asthma medication and included questions on bronchodilators and anti-inflammatory drugs, their different mechanisms and when to use them, questions on the side-effects of different drugs, and prophylactic medication. Ten items included questions on asthma-triggering factors, self-monitoring of the disease, breathing techniques and physical exercise. The maximum score for the questionnaire was 28.

The SIP developed by Bergner et al. (1981) is a behaviorally based measure of health-related limitations in the daily lives of both chronically and acutely diseased subjects. It is self-administered and consists of 136 items that can be grouped into 12 multi-item subscales: ambulation, body care and movement, mobility, emotional behavior, social interaction, alertness behavior, communication, sleep and rest, household management, work, recreation and pastimes and food intake. A percentage score (0-100) can be calculated for each of the 12 subscales. The subscales ambulation, body care and movement, and mobility are aggregated to form a physical index and the subscales emotional behavior, social interaction, alertness behavior and communication are aggregated to form a psychosocial index. Moreover, it is also possible to calculate the total SIP score. The higher the scores, the poorer the patients' perceived, health-related, functional status.

The SIP has been translated into Swedish and evaluated in Sweden (Augustinsson et al., 1986; Sullivan et al., 1986) and has been extensively used in Sweden in patients with chronic conditions (Björvell and Hylander, 1989; Gardulf et al., 1993; Langius and Björvell. 1993; Langius et al., 1994; Klang et al., 1996a, 1996b, 1996c; Larsen et al., 1996, Tyne-Lenné et al., 1996). It was therefore decided to use the SIP also for the asthmatic patients. Another reason for choosing the SIP was that at the time of the study, no asthma-specific quality of life questionnaires were available in Swedish.

Data for a Swedish, national reference group is available (Langius and Björvell. 1993). This national reference group consists of randomly sampled adults (n = 145, 70 men and 75 women, mean age 48, range 26-70 years) from the Stockholm County.

Both the study-specific questionnaires and the SIP questionnaire were self-completed by the patients at the hospital prior to their first lecture and one year after the participation in the Asthma School. The specialist clinical nurse, who was responsible for the Asthma School, was available to answer questions if needed.

2.2.3. Monthly diary card

A monthly diary card with 11 questions was used during the year following the Asthma School. The items concerned the patients' medication, absence from work due to asthma, hospital care and visits to the emergency room.

2.2.4. Lung-function tests

The forced expiratory volume in one second, FEV₁, was measured by spirometry (with a body plethysmograph, Jaeger MasterlabTM) on two occasions, immediately prior to the Asthma School and one year later.

2.2.5. Statistical methods

The p-value for statistical significance was set below 0.05. Statistical significance over time were tested by the Sign Test. Differences regarding the SIP scores between the asthmatics and the national reference group were investigated by Student's t-test.

2.2.6. Ethical considerations

All the patients were given both written and oral information about the study. Written, informed consent was obtained from the patients who participated in the study. The study was approved by the local Ethical Committee at Huddinge University Hospital.

3. Results

3.1. Knowledge of the disease and the asthma medication

Before attending the Asthma School, the mean score for the 26 items concerning knowledge of the disease, asthma medication, asthma-triggering factors, self-monitoring of the disease, breathing techniques and physical exercise was 15 (range 4-24) out of a possible 28. One year later, the mean total score had increased to 20 (range 14-26) ($p < 0.001$). No statistical differences as regarded gender, age or educational level were seen.

3.2. Smoking habits

Before the Asthma School six patients (19%) were current smokers, 12 patients (37%) were ex-smokers and 14 patients (44%) had never smoked Table 1. One year later, three patients (9%) were current smokers and consequently 29 patients (91 %) were ex-smokers (n.s.).

3.3. Use of peak expiratory flow meters (PEF-meters)

Twelve of the 32 patients participating in the study (37%) used a PEF-meter before entering the Asthma School. One year later, 21 patients (66%) stated that they had regularly measured their peak-flow values ($p < 0.01$). None of the patients using the PEF-meter before entering the education discontinued to use it.

3.4. Lung-function test

Before entering the Asthma School, 24 patients (75%) had a forced expiratory volume (FEV1) that was $> 80\%$ of the predicted value. Eight patients (25%) had a FEV1 less than 80% of the predicted value, i.e. a decreased lung-function capacity. The proportion of patients with a decreased lung-function capacity at follow-up was 19 % ($n = 6$).

The mean FEV1 before entering the education was 96% of the predicted value (2.79 lit.). One year later, the mean FEV1 still was 96% of the predicted value (2.83 lit.) (n.s.).

3.5. Use of asthma drugs

Thirty patients were treated with preventive inhalation medication, i.e. anti-inflammatory drugs, both before and after attending the Asthma School. No pronounced changes in dosages could be found over time (data not shown).

All 32 patients were treated with inhaled bronchodilators on a daily basis both before and during the year after the intervention. Before the education, 14 patients (44%) used this type of treatment on an as-required basis. One year later, 20 patients (63%) used inhaled bronchodilators on an as-required basis ($p < 0.05$).

3.6. The patients' need for medical care and sick-leave

During the year preceding the Asthma School, eight patients (19 visits) had to visit the Emergency Room, owing to exacerbation of the asthma disease. The corresponding data for the follow-up year were eight patients, of whom three were the same as before the education (19 visits).

Table 2

The Sickness Impact Profile. Comparison before and 12 months after concluded Asthma School. A comparison between the asthmatic patients before Asthma School and a Swedish national reference group is also shown. The data are given as means, standard deviations (SD), medians and range scores. The higher the scores, the poorer the self-rated functional status

	Before Asthma School (n=32, 6 males, 26 females, mean 43, range 18-67 years)				12 months after Asthma School (n=32, 6 males, 26 females, mean 43, range 18 67 years)				Sign test comparison of scores before and 12 months after Asthma School	Swedish national group (n = 145, 70 males and 75 females, mean 48, 26 70 years)	Student's t test com- parison of scores between asthmatics and refer- ence group before Asthma School			
	mean	SD	median	range	mean	SD	median	range	p-values	mean	SD	median	range	p-values
Overall SIP	4.9	5.1	2.9	0.0-22.0	4.9	6.4	1.8	0.0-22.7	n.s.	1.3	2.6	0.4	0.0-18.7	p<0.001
Physical dimension	1.6	2.5	0.0	0.0-9.9	0.6	1.4	0.0	0.0-6.6	p<0.01	0.4	1.7	0.0	0.0-14.1	p<0.01
Ambulation	4.1	6.3	0.0	0.0-20.3	4.3	9.3	0.0	0.0-42.6	n.s.	0.8	3.4	0.0	0.0-25.1	p<0.001
Body care/movement	0.5	1.8	0.0	0.0-8.1	0.4	1.1	0.0	0.0-4.4	n.s.	0.3	1.9	0.0	0.0-18.6	n.s.
Mobility	1.1	4.4	0.0	0.0-23.4	1.6	4.6	0.0	0.0-23.4	n.s.	0.3	1.9	0.0	0.0-16.7	n.s.
Psychosocial dimension	4.1	8.1	0.0	0.0-33.1	4.3	7.4	0.0	0.0-24.8	n.s.	1.6	4.2	0.0	0.0-28.9	p<0.05
Emotional behavior	8.2	12.2	0.0	0.0-41.7	7.3	11.6	0.0	0.0-33.9	n.s.	3.1	8.0	0.0	0.0-40.7	p<0.001
Social interaction	1.7	4.4	0.0	0.0-19.4	3.6	8.9	0.0	0.0-33.1	n.s.	1.4	4.3	0.0	0.0-31.5	n.s.
Alertness behavior	3.7	12.0	0.0	0.0-55.2	3.7	10.3	0.0	0.0-39.8	n.s.	1.3	5.6	0.0	0.0-50.2	n.s.
Communication	1.3	5.7	0.0	0.0-29.9	1.3	3.3	0.0	0.0-11.4	n.s.	0.1	0.8	0.0	0.0-9.2	n.s.
Sleep and rest	9.7	9.2	9.8	0.0-35.9	7.6	8.5	9.8	0.0-33.7	n.s.	3.7	7.1	0.0	0.0-35.9	p<0.001
Home management	3.3	6.5	0.0	0.0-24.7	4.9	11.7	0.0	0.0-42.1	n.s.	0.6	3.9	0.0	0.0-33.7	p<0.01
Work	4.5	12.8	0.0	0.0-70.1	5.9	17.4	0.0	0.0-70.1	n.s.	2.4	8.7	0.0	0.0-70.1	n.s.
Recreation and pastimes	9.9	11.0	8.5	0.0-39.6	7.7	11.3	0.0	0.0-42.4	n.s.	7.0	13.0	0.0	0.0-66.1	n.s.
Eating	0.5	1.6	0.0	0.0-5.2	0.7	1.8	0.0	0.0-5.2	n.s.	0.2	1.1	0.0	0.0-5.3	n.s.

Admission to hospital owing to the asthma disease was very rare. Three patients (range 1-5 days) were admitted the year before the Asthma School. The year after attending the program, three patients (range 1-11 days), of whom two were the same both before and after, had to be admitted. During the 12 months preceding the Asthma School, 14 of the patients (44%) had been on sick-leave, owing to their asthma. The number of days on sick-leave ranged from 2 to 200. During the follow-up year, significantly fewer ($p < 0.05$) patients ($n = 6$) were on sick-leave (10-25 days).

3.7. The patients' self-rated functional health-status

One year after the completion of the Asthma School program, the patients rated their physical capacity as improved ($p < 0.01$). There were no significant statistical changes for the rest of the SIP scales (Table 2).

Comparisons of SIP scores between the asthmatics before entering the education and the national reference group showed that the asthmatics rated their functional status as poorer in the following individual domains: sleep and rest ($p < 0.001$), ambulation ($p < 0.001$), emotional behavior ($p < 0.001$) and home management ($p < 0.01$). Furthermore, higher scores (i.e. worse functional status) were found for the asthmatic patients for both the physical ($p < 0.01$) and psychosocial ($p < 0.05$) dimension scales, as well as for the overall SIP score ($p < 0.001$) Table 2.

4. Discussion

The aim of patient education is to assist the patients to gain new information, skills and attitudes, in order to improve their health behavior and/or health status and to enhance their compliance with treatment (Mazzuca, 1982; Lorig, 1992; Pfister-Minogue, 1993; Partridge, 1995). In the present study, patients with asthma were investigated before and one year after a specific asthma-education program directed by a specialist clinical nurse. The ideal study would have been a randomized controlled study (RCT). This matter was discussed among the authors, but due to ethical considerations it was decided to choose the design used. One reason for not choosing the RCT was that the Asthma School had already been ongoing since 1986. We therefore found it difficult to withdraw patients the possibility to participate in the education program.

The patients included in the study were closely followed at the same clinic during the follow-up year, regarding their knowledge of the disease, self-management (PEF-meter, drugs), need for medical care and sick-leave, and perceived functional health-status. However, a proportion of the patients could unfortunately not be included in the evaluation for several reasons, the two main ones being that they declined participation or that they did not for unknown reasons complete the educational program. Other studies evaluating asthma-education programs have also reported high drop-out values (Hilton et al., 1986; Ringsberg et al., 1990).

The total knowledge score was significantly higher one year after attending the education program. Other studies have also shown that the education of asthmatics leads to increased knowledge scores when tested. Hilton et al. (1986) studied 274 patients in three different education groups. The patient group that gained the most education showed a significantly higher knowledge score, as compared with the other two groups. Also Ringsberg et al. (1990) have earlier shown that asthma education increases the knowledge of the disease and how to handle it. Moreover, Taggart et al. (1991) found that asthmatic children and their parents who participated in an education program had an improved knowledge of the disease.

The overall aim of the Asthma School was to improve the patients' self-management. The PEF-meter is used by the patients to monitor the disease by adjusting the dose of inhaled steroids. The Grampian Asthma Study of Integrated Care (GRASSIC) found in their study (GRASSIC, 1994) that possessing a PEF-meter led to improvement in self-management for patients with severe asthma. The GRASSIC group therefore recommended that PEF-meters should be used as self-monitoring devices and especially by patients whose asthma was severe or difficult to treat. In the present study, it was found that an increased number of patients reported that they used their PEF-meters regularly one year after the Asthma School.

According to the International Consensus Guidelines on Asthma Management (International Consensus Report, 1992), bronchodilators should be used on an as-required basis, i.e. only when symptoms occur. In the present study, an increased number of patients used this therapy regime one year after the Asthma School. The lack of improved FEV1 in the group of patients at follow-up, is in agreement with findings in other studies (GRASSIC, 1994, Tilly et al., 1996).

Significantly fewer patients were on sick-leave due to asthma one year after the education, suggesting that the patients now knew what to do when their asthma deteriorated. The ability to deal with exacerbations of asthma is one of the chief aims in patient education and our data show evidence in that direction. It has earlier been documented that asthma education reduces the number of days in hospital, as well as visits to the Emergency Room (Beckman and Nyström-Larsson, 1982; Ringsberg et al., 1990). However, this was not found in the present study.

In this study, the SIP was used in order to measure the asthmatics' self-rated, functional status, both before and after the Asthma School. Comparing the SIP scores before entering the education with the Swedish reference group, the asthmatics' functional health status was found to be worse. The asthmatics in the present study rated their physical health-status as improved one year after participating in the Asthma School. An improved functional health-status after education is in accordance with the study by Ringsberg et al. (1990) who also found a general improvement in the quality of life after asthma education.

Although a significant difference was found for the aggregated physical SIP scale at follow-up, the subscales in this dimension and several of the other scales had median scores equal to zero already before the initiation of the Asthma School. This means that the scope for improvement was reduced as the baseline scores were already as good as they could be. Considering this, the patients' self-rated, functional health might have improved even more than could be shown by using the SIP.

In conclusion, the evaluation one year after completing the Asthma School program showed that the patients included had a better knowledge of their disease, used the self-management tool (PEF-meter) to a greater extent, had fewer days on sick-leave and rated their physical health status as better.

Patient education is an active process to further strengthen the patients' self-care. The specialist clinical nurse has a vital role in this process in order to educate, train and support the patients.

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References

- Augustinsson, L., Sullivan, L., Sullivan, M., 1986. Physical psychologic and social function in chronic pain patient! after epidural spinal electrical stimulation. *Spine* 11, III119.
- Beckman, L., Nyström-Larsson, C., 1982. Minskat antal vard dagar för astmatiker efter gruppinformation LÅkartidningen 79. 1353.
- Bergner, M., Bobbitt, R., Carter, W., Gilson, B., 1981. The Sickness Impact Profile: development and final revision of a health status measure. *Medical Care* 19, 787-805.
- Björvell, H., Hylander, B., 1989. Functional status and personality in patients on chronic dialysis. *Internal Medicine* 226.319-324.
- Blackwell, B., 1992. Compliance. *Psychotherapy Psychosomatics* 58. 161-169.
- Gardulf, A., Björvell, H., Gustafson, R., Hanimarström, L., Smith, C., 1993. The life situations of patients with primary antibody deficiency untreated or treated with subcutaneous gammaglobulin infusions. *Clinical and Experimental Immunology* 92, 200-204.
- GRASSIC, 1994. Effectiveness of routine self-monitoring of peak flow in patients with asthma. *British Medical Journal* 308, 564-568.

- Hilton. S., Sibbald. B., Anderson. H.R. Freeling, P., 1986. Controlled evaluation of the effects of patient education on asthma morbidity in general practice. *Lancet* i. 26-29. International Consensus Report on diagnosis and management of asthma. 1992. *Allergy* 47 (Suppl), IS-60S.
- Jenkinson, D., Davison. J., Jones, S., Hawkins. P., 1988. Comparison of effects of self-management booklet and audiocassette for patients with asthma. *British Medical Journal* 297, 267-270.
- Klang. B., Björvell. H., Clyne, N., 1996a. Quality of life in predialytic uremic patients. *Quality of Life Research* 5, 109-116.
- Klang, B., Björvell. H., Clyne, N., 1996b. Perceived wellbeing in predialytic uremic patients. *American Nephrology Nurses Association* 23. 223-260.
- Klang, B., Björvell. H., Cronqvist, A., 1996c. Patient with chronic renal failure and their ability to cope. *Scandinavian Journal of Caring Sciences* 10, 89-95.
- Langius, A., Björvell. H., 1993. Coping ability and functional status in a Swedish population sample. *Scandinavian Journal of Caring Sciences* 7. 3-10.
- Langius, A., Björvell. H., Lind. M.G., 1994. Functional status and coping in patients with oral- and pharyngeal cancer before and after surgery. *Head and Neck* 16. 559-568.
- Larsen, J., Gardulf, A., Nordström, G., Björkstrand, B., Ljungman, P., 1996. Health-related quality of life in women with breast cancer undergoing autologous stem-cell transplantation. *Cancer Nurs.* 19, 368-375.
- Lorig, K., 1992. What do we know about what works? In: *Mosby Year Book*. pp. 107-134.
- Lundbdck. B., Stjemberg. N., Jonsson. A.-C. et al., 1993. The prevalence of asthma and respiratory symptoms is still increasing. Umei University.
- Mazzuca. S., 1982. Does patient education in chronic disease have therapeutic value? *Journal of Chronic Diseases* 35. 521-529.
- Partridge. M.R., 1992. Education and compliance. In: Barnes, P.J., Rodger, I.W., Thomson, N.C. (Eds.). *Asthma. Basic mechanisms and clinical management*. 2nd ed. Academic Press. London, pp. 723-731.
- Partridge. M.R., 1995. Delivering optimal care to the person with asthma: what are the key components and what do we mean by patient education? *European Respiratory Journal* 8, 298-305.
- Pfister-Minogue. K., 1993. Enhancing patient compliance. a guide for nurses. To increase their patients compliance with health recommendations. nurses need a framework. *Geriatric Nursing* 14, 124-132.
- Ringsberg. K.C., Wiklund. I., Wilhelmsen. L., 1990. Education of adult patients at an 'asthma school': effects on quality of life. knowledge and need for nursing. *European Respiratory Journal* 3. 33-37.
- Smith, C.E., 1987. Nurses' increasing responsibility for patient education. In: *Patient education. Nurses in partnership with other health professionals*. Philadelphia. USA. W. B. Saunders Company, pp. 3-29.
- Sullivan, M., Ahiman, M., Archenholtz, B., Svensson, G., 1986. Measuring health in rheumatic disorders by means of a Swedish version of the Sickness Impact Profile. *Scandinavian Journal of Rheumatology* 15. 193--200.
- Taggart, V.S., Zuckerman. A., Sly, R., 1991. You can control asthma: evaluation of an asthma education program for hospitalized inner city children. *Patient Education Counselling* 17, 35-47.
- Tilly, K.F., Garvey, N.J., Gold, M., Powell. E., Proudlock. M.L., 1996. Outcomes management and asthma education in a community hospital: ongoing monitoring of health status. *Quality Management in Health Care* 4, 67-78.
- Tyne-Lenné R., Gordon. A., Sylvé, C., 1996. Improved health-related quality of life in moderate chronic heart failure following submaximal exercising of leg muscle. *Journal of Cardiac Failure* 2. 117-117.

Questions about this paper

- (a) In Section 3.1, what is meant by 'p<0.001'? What can we conclude from this?
- (b) In Section 3.2, what is meant by 'n.s.'? What can we conclude from this?
- (c) In the SIP table, what is the most frequent score for the baseline score in the ambulation dimension?
- (d) What limitations does the lack of a control group lead to?
- (e) What bias, if any, might there be in the patients' response concerning the use of a PEF-meter (Section 3.3.)?
- (f) What bias, if any, might there be in the FEV1 measurement (Section 3.4.)?
- (g) In the SIP table, why should we be cautious in interpreting the significant change in the physical dimension?